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ABSTRACT

Education in general and specific educational projects fit into the construct of the allocation of investment resources that is basic to economic theory. Two techniques of computing returns to education and education projects are benefit-cost ratios and rates of return, which both rely on measuring costs and benefits. While measuring costs is relatively easy, measuring benefits is difficult because of the problems of identifying benefits and isolating benefits stemming from specific programs, trying to measure social versus private returns, the need to use experience to predict future income levels, and the marginal nature of calculations. The manpower approach is often suggested as a substitute method, but because it solves the problems of the other two techniques by ignoring them, its difference is illusory. The techniques are actually successive approaches to computing the returns to education and educational projects. The unique nature of non-formal education and the lack of clear definition of intended results cause problems in the measurement of program output. Further, the potential of economic theory with respect to non-formal education in the rural sector is discouraging because of the lack of cash wages among peasants, lack of record keeping, and difficulty of determining the effect of one new skill among many. (SB)

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CONTRIBUTIONS AND SHORTFALLS: ECONOMIC ANALYSIS AND NON-FORMAL EDUCATION

John M. Hunter

Introduction

The economic problems associated with education in general and non-formal education in particular are deceptive in that they appear to be simple. In essence, they are not different from other problems of investment,[1] and economic theory has been clear on the major elements of investment criteria for a century or so. But there is a notable paucity of solid, definitive empirical work regarding investment in education. If the theory is indeed sound, this scarcity must stem from either a lack of interest or in methodological problems with the application of theory. In recent years interest has increased, and methodology has been the deterrent. This essay will concentrate largely on these methodological problems as they relate to non-formal education.[2]

Elementary theory indicates that investment should continue in a particular investment opportunity so long as increments to it continue to yield higher returns than they would in other possibilities. Suppose this prescription is followed for each alternative investment until the available resources are exhausted. Then, resources will be distributed among the various possibilities so that the return produced by the last unit invested in each will be equal for all

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alternative investment opportunities. If this were not the case, it would be possible to withdraw some units of low yield and to add them to opportunities where the yield is higher, thus increasing the total return.[3] Education in general and specific educational projects fit well into this theoretical construct, and the analysis below will explore the application of this general "rule" for allocating investment resources.

There are three general levels at which the problem of allocation of resources may be considered and for which the *economizing* questions may be asked; this is to say that the investment principle may be applied at several levels. The most general question is asked at the highest level: How much of the nation's resources should be allocated to education in comparison with agriculture? defense? transportation? culture? Public and private resources for education are involved which raises difficult problems for central planners when large segments of educational expenditures are either made privately or at the option of local governments. Decisions, nonetheless, must be made--consciously or not, wisely or not, rationally or not.

Once resources have been allocated to the education planning authorities, second level decisions must be made: How much should go to higher education? How much to other levels? How much to future development such as teacher training, and how much to present "consumption" of educational resources? These questions are essentially intra-ministerial, but the "educational establishment" must also deal with educational activities of ministries other than that of education; and these ministries will surely incorporate many of the public, nonformal educational activities. Further, the "establishment" will need to account

for activities of the private sector and determine how that sector may be encouraged to fill its anticipated or projected role. This *is* educational planning whether it be well or poorly done, whether it be conscious and formal or haphazard by default. The decisions cannot be avoided--they can only be better-taken or more poorly-taken.

The "rule" at both these levels is designed to maximize the return from the amount of resources available. Maximization is similarly a valid desideratum at the very lowest level of conceptualization where resources are considered *given*, and the problem is to maximize the "product" or "output" utilizing that given input. This is particularly the case at the program or sub-program level. With the resources given and a minimum quality standard for the product described, the task is to produce the most (or best) product possible with the given resources. This may be considered an "administrative" problem rather than an "economic" one. Naming the problem is not nearly so important as solving it since failure to do so wastes resources, something which no one--but especially the poor--can afford to do.

The matter of efficiency at this level has great significance to the investment "rule" since the rule assumes implicitly that alternative uses of resources utilize them efficiently or, at least, that there is no difference from use-to-use in the degree of wastefulness. If there is variation, then the rule must be stated in terms of *actual* returns rather than *potential* returns. Thus, the levels described above are not independent of each other.

Estimates of returns to various alternative investment possibilities already take into account the level of efficiency found at the project level. This is done by assuming that all resources are efficiently utilized.

These general comments apply to non-formal education as a part of education in its competitive quest for funds[4] and as a claimant for a share of funds somehow allocated to education. At the third level and with respect to efficiency, there is, of course, no more reason to justify the waste of funds for non-formal education than there is for any other activity.

Cost-Benefits and Rates of Return

There are two similar techniques of computing returns to education and/or educational projects. These are the familiar benefit-cost ratios and internal rates of return. In the former, if benefits are the numerator of the fraction, then the larger the benefit-cost ratio, the more desirable the project. And one would continue to invest in that project so long as the ratio, at the margin, continued to exceed that in other alternatives. The rates of return approach expresses results not in an explicit ratio but as a rate of return to the investment (cost). It is that rate at which the income stream from the investment would be discounted so that costs and the present value of the income stream would be equal. The higher the rate so computed, the better the project and the greater the probability that it should be considered as a recipient of investment when compared to alternatives. The results of the two procedures are essentially the same

in character so that it is not necessary to examine both techniques separately in great detail.[5] Even though they are similar in character, a different ordering of projects may be produced by use of these two techniques. Indeed, even if one utilizes only one of them, choices of techniques in treating the variables may alter the rank order of projects.

Two elements are evidently involved in both approaches. An examination of "costs" will be undertaken first to be followed by a consideration of "returns."

Costs

Costs are by far the easier of the two to treat. Costs may be considered in three categories: explicit and implicit costs, and joint costs. Explicit costs are those which involve actual expenditure for the particular project with which one is dealing. These might be teachers' salaries, books, and other expenditures which can easily and *exclusively* be identified with the project in question. Implicit costs are those which involve the use of resources which should be paid but for some reason or other, are not. The appropriate cost is that which should have been paid but was not. Joint costs are those which are inextricably associated with two or more activities. Administrative expenses, depreciation charges on fixed assets such as buildings, the costs of equipment used for industrial production during the day and instruction at night are examples of joint costs. The existence of joint costs depends upon facilities or services *shared*. There will be fewer joint cost problems at the agency or school level since these are the services and facilities which are usually shared. But at lower levels of programs and courses, the joint-cost problem becomes more important since these are the elements which do the sharing. Interests in costs in non-formal education will perhaps frequently be at the program level; consequently, the joint-cost problem will be of importance.

In one case, the "joint-cost" problem was so severe that the cost-benefit approach had to be abandoned. The accounting system of SENAI demanded scarcely any discrimination of costs at the unit or school level, yet it was training plumbers, sheet metal workers, machine tool operators, etc., in a great variety of programs--requiring different facilities, time periods, instructional staff, materials. In this particular circumstance, the accounting system did not discriminate costs as carefully as it should (could?) have, and almost all costs appeared to be joint costs. On the other hand, a great deal of effort can be expended and arbitrariness inserted in efforts to prorate all costs to particular final outputs.[6]

Depreciation of fixed assets and similar costs are "joint costs" with the sharing of costs not between projects but between time periods. These are not *paid out* to anyone in each accounting period, but they are real nonetheless and should be accounted for. Joint costs and implicit costs are difficult problems to deal with, and solutions are perforce arbitrary. The temptation is strong simply to leave them out, but this clearly understates costs.

The most common implicit cost of education is that of "income forgone." Many of the consumers of education have other alternatives open to them while they undertake educational activities. They might have earned income in a job, they might have given up a better job in some other location in order to obtain schooling, and so forth. This element can be ignored for the very young since the alternatives open to them are generally not remunerative, but for youngsters in the Third World who enter the labor force

at eight, ten, or twelve years of age, income forgone both for them as individuals and for their families may become much more important at these ages than we are apt to consider it. Treating income forgone in non-formal education is especially important and especially difficult. It is important because the participants of non-formal education are apt to be mature individuals who do earn income; consequently, the concept of forgone income is likely to apply to a high percentage of the participants. It is especially difficult to handle because of both the heterogeneity of programs and of participants. Furthermore, there is the possibility of income forgone (production) by the employers if the non-formal experience is on-the-job.

A recent description and evaluation of the Nicaraguan literacy campaign illustrates the real nature of income (broadly defined). Much of this campaign was carried out in rural areas by brigadistas who shared the meager food and lodging of their "pupils." "To avoid conflict with the revolutionary government's goal of reactivating the economy, crusade leaders had to agree to conduct literacy training only two hours a day and on weekends. They also agreed to emphasize agricultural production in the literacy workbook and to urge literacy instructors to help campesinos . . . in the fields in order to create time for classes." The campaign slogan "la meta del brigadista: levantar la producción durante la alfabetización" is evidence of awareness of potential income or production forgone as an implicit cost.[7]

We need also to distinguish between "social" costs and "private" costs although the distinction between social and private *returns* is much more important and will be examined below. Private costs are those payments

necessary to attract resources to do particular tasks; social costs are what society gives up in having resources involved in doing particular tasks. In a neat world, with resources paid the value society puts upon them, there would be no difference between the two. In a few cases in education, the difference between social and private costs exists and may even be important. Suppose private schools are parochial and staffed by priests and nuns. These teachers are remunerated by their orders so as to provide them with subsistence levels of living and little else. This maintenance is the *private cost* of these resources, but the cost to society is at least what comparably trained human resources could command in a free market. Utilizing only private costs in these circumstances would grossly underestimate the cost of the education. For the most part, though, this is no real problem--especially compared to the problems of treating the disparities between social and private returns.

Benefits

The numerator of the benefit-cost ratio is much more difficult to manage largely because of operational difficulties in measurement.

The initial difficulty comes from adequately defining "benefits." What are the objectives of a particular program? What are the means of measuring outcomes of it? If we are to compare the values of those outcomes to the costs of producing them, how do we value outcomes? Returning to the Nicaraguan example, the primary objectives of the campaign were:

1. to eradicate illiteracy in Nicaragua;
2. to conscientize and politicize the illiterate population;
3. to conscientize Nicaragua's youth on the life and problems of the rural population;
4. to prepare the foundation of the Vice-Ministry of Education for Adults to follow up the crusade;
5. to strengthen the organization of the masses;
6. to deepen national integration.[8]

The words (mostly) are clear enough, but not a single objective above lends itself to unambiguous measurement, much less valuation. To make matters worse, a list of secondary objectives--at least more nearly quantifiable--was developed:

1. eradication of malaria;
2. collection of examples of flora and fauna from the different regions of the country;
3. a census of work, unemployment, agrarian systems, and land distribution;
4. collection of folk legends and regional popular songs;
5. inspection of possible archaeological and mineral sites;
6. collection of oral histories of the recent war;
7. improvement of sanitation.[9]

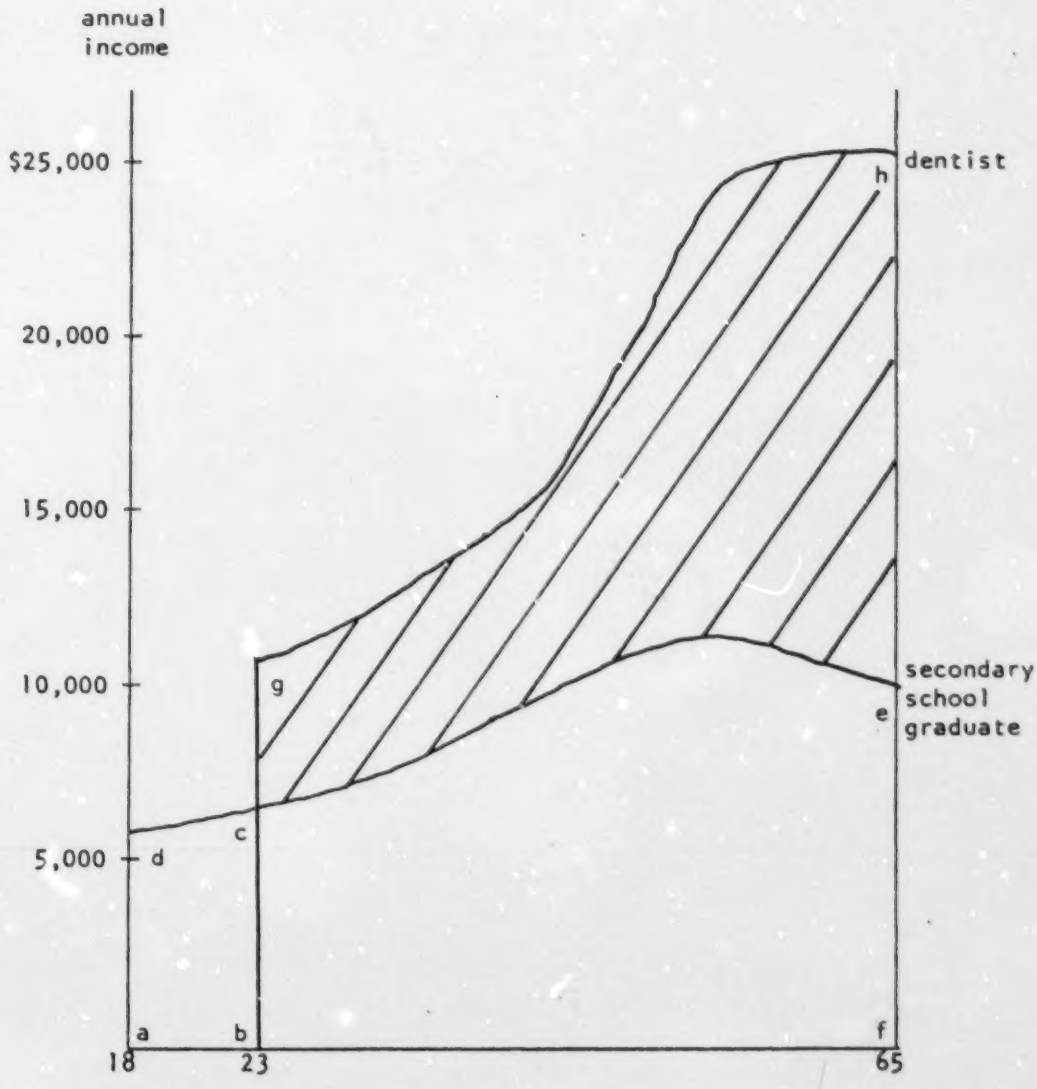
The purpose in listing these objectives is to cite a real case of highly commendable objectives which do not readily (if at all) lend themselves to quantification and subsequent summarization into a single value figure. The fact of not being quantifiable makes no judgment at all about the set of policies; it simply says they are not treatable with the particular tools of economics which we are

examining. A corollary suggests itself: only a fool would select policies because they are amenable to analysis with the tools he has at hand!

Some of the difficulty sometimes disappears when one separates private returns (benefits) from social returns. In programs related, say, to fertilizer, improved tools, vocational education, much of the incremental change accrues to the individual. Analysis of this phenomenon may be helpful, and we first turn to examination of private returns.

The prime difficulty in measuring private returns is that of isolating the benefits flowing from a specific educational experience. Essentially, we want to know how much more an individual (group) will earn in the course of his lifetime as the result of an educational experience than he would have earned without having had the educational experience. This is easy to state, but the methodology is another story. "Earnings profiles" are resorted to for this purpose. From records[10] of present earnings of individuals whose ages cover a broad span, future earnings are projected for two groups, theoretically alike in every respect except that one was subject to some definite educational experience while the other was not.

An example demonstrates the technique. This particular one is drawn from a study done in Brazil seeking to evaluate various kinds of higher education. Earnings of secondary school graduates (the control group) were projected from cross-sectional earnings data, and the earnings of dentists were similarly projected. These two profiles are juxtaposed in the accompanying diagram. In each case, earnings are estimated for an



(hypothetical data)

average individual in each group from the time he enters the labor market until he retires or otherwise withdraws. The earnings of the secondary school graduate through his lifetime are represented by the area "adef" and those of the dentist by "bghf." The difference between the two ("cghe") is attributed to the dentist's additional education. Since the dental student begins earning later and since the structure of the earnings through time is different (i.e., the peak for the secondary graduate comes at an earlier age), the two income streams must be discounted (presumably by the current rate of interest) to be comparable. The difference between the present (discounted) values[11] could then be compared to the cost of dental education and a benefit-cost ratio computed. If only the costs of the education to the student are considered, the result is a *private* benefit-cost ratio. If the subsidization of education (i.e., cost to the state) is included, then a social benefit-cost ratio is at least approached. Or, alternatively, the question could be posed, "At what rate does the income attributable to dental training have to be discounted to make it equal to the cost of that training?" The mathematics is a bit complicated but the concept is easy enough; and the result would be an "internal rate of return" for post-secondary, dental education.

There are a number of serious criticisms not so much of the approach but of the techniques one has to employ in order to obtain that ultimate *desideratum*, a datum. These will be examined with special attention to their significance in Third World situations.

1. Most important, this is all reconstruction from the past. The passage of time may make considerable difference. For example, in the case above, estimates for the future are based on current earnings of dentists some of whom finished their training (say) forty years ago. The profile shows earnings peaking at age 60, and this information is gleaned from the present earnings of dentists who graduated when they were about 25 years of age. The extrapolation of information derived from what dentists at various ages now earn to estimate the earnings of the average future dentist through his lifetime is at least heroic. But even worse, of interest to the Third World are *new* occupations and *new* training experiences in radically different labor markets for which past or even present experience is of no help whatsoever. In the absence of historical information--even if one were to admit its relevance--new techniques[12] need to be sought and found to substitute for the preoccupation with the manipulation of numbers, any numbers, to seven decimal places--however doubtful may be the results.

2. There is implicit in the method the assumption that the group of interest and the control group are in all respects homogeneous except for the one different application of education. This may or may not be the case; but if it is not, the analysis falls of its own internal weight. If the two groups vary in more than one element, then assignment of differences in earnings to just the difference in educational experience is not legitimate. Suppose that those ambitious enough to get through dental school are those who hanker effectively for money. Then the analysis may demonstrate only that those willing to work hard enough for money will get more than those who are not willing to do so--which is a sort of primitive conclusion.

This difficulty with the "control group" is probably serious in any case, but it becomes a particularly great problem related to non-formal education. Non-formal education may be experienced by individuals in small, discrete, and multiple doses. In the case of the four-year dental program, this was a massive increment compared to any casual post-secondary educational experiences of secondary graduates, and it could have been reasonable to associate differences in income with the one difference in education. With shorter, more numerous, multiple programs, the problem of identifying associations is much more difficult.[13]

3. This analysis assumes, too, that prices paid in the labor market are determined under competitive conditions or at least that there is no more non-competitive behavior in the market for the sample group than for the control group. The assumption in its purer form is necessary for the wage to be equal to the value of the product of the worker, i.e., so that earnings are an adequate measure of the value of the worker's contribution to society. Consider the case of an apprenticeship experience in some closed occupation, say, meat cutting. Meat cutters through their ability to restrict entry can exercise monopoly power in the sale of services. Observed differences in earnings between a group of "graduated" apprentices and a control group would be attributable both to the educational experience and to the "closed" nature of the occupation. This has particular importance for non-formal education in the Third World because (1) non-formal education has particular relevance to the acquisition of industrial skills, and (2) the role of unions in such economies is frequently to protect skilled industrial workers not only against the parsimony of management but against the encroachment (i.e., "competition") of the unskilled masses.

4. Also of considerable importance is the criticism that this analysis is valid for prescribing at the margin. Technically, it can prescribe what should be done with small increments of funds as between a number of functioning projects. It does not tell much about what should be done with large chunks of new funds and how to allocate them among many new, non-functioning programs. The task of planners in the Third World is just that, though--making revolutionary changes in the large with new approaches and new programs.

Suppose the planner overcomes all these difficulties and has produced a suitable benefit-cost calculation. Is his task finished? By no means! We recall the purpose of the exercise in the first place: to compare one investment alternative with all others. That is, a single benefit-cost ratio is no guide at all to selecting between alternatives, and so a whole raft of them is needed to be of much assistance to the planner.

The problems of measuring social benefits as compared to private benefits are enormous. For the most part, market prices paid for labor may reasonably represent private benefits although we have already noted exceptions. What the priest may receive in economic emoluments are properly his private returns but are certainly no measure of the returns to society. The earnings of urban physicians as compared to rural physicians are vastly different, but it is doubtful that the social value of their services varies as much. Teachers are frequently "underpaid" according to what they contribute to society and according to the cost of their production.

There are all sorts of social returns associated with general education and with literacy in particular, especially if one values "democracy" highly. A socio-political system which permits the individual to participate actively in the control of the world around him *per se* places a high value on at least a modest dollop of universal, general education. The individual in such a system must be informed and be able to obtain information through various sources, so the social returns to education are enormous, however incalculable, in proportion as one values democracy. One may speculate from its behavior that the Latin American oligarchy in the first century of independence must have conceived the social returns (from its *own* point of view) to universal education as having been negative, i.e., as being a threat to the existing pattern of life.

There is now a describable and fairly clear role for education in the process of "development" or "modernization" of Third World economies. The extension and integration of national markets, the expanding size of producing units, the extension of credit systems, the increased roundaboutness of production demands more clerks, accountants, more correspondence, more litigation, more inventory, more anticipation, all of which requires increased skills of more people. Note 1 announces my intent to avoid discussing the relationships between education and development, but there is need here to note them in the context of social returns. Education may make a positive contribution to development which the market for skills might not recognize and reward. Then, estimating "social returns" would involve trying to fathom education's contribution to developmental objectives and thus trying to put some value on them. To estimate social returns adequately would involve

thus a very carefully spelled out theory of the relationship between education and development with some means of putting values on increments of the latter.

Summarizing this section, both benefit-cost and rates of return approaches rely on measuring costs (which is relatively easy although there are some significant problems) and benefits. The latter present very difficult practical and methodological dilemmas particularly with the identification and isolation of the benefits from specific programs. This involves identifying an "experimental" group and comparing it appropriately to a control group. Another major difficulty involves trying to measure social returns and then to add them to private returns. Still other difficulties relate to the need to resort to past experience to project future income profiles when it is emphatically the rupture of the pernicious past and present that is sought. Furthermore, the marginal nature of the calculations and their subsequent prescriptions is still another cogent criticism. The difficulties appear to be, and indeed are, enormous.

The Manpower Approach: A Substitute?

The "manpower approach" is sometimes considered to be a substitute, and a desirable one, for the benefit-cost and rates of return approaches.[14] In some respects, it is an adequate substitute, but fundamentally it "solves" the prime problems of the other two approaches by ignoring them. Possibly its principal advantage is that it permits ignoring basic issues which are

empirically difficult to deal with and encourages the attack on practical problems which can be solved. Examining this paradoxical (or ambiguous) statement regarding these procedures is the main objective of this section.

The manpower approach begins by asking the question: What are the present manpower resources of the economy in question? And then it follows with: What are the manpower needs of the economy likely to be at some target date? The "problem," then, for the educational community is to move as expeditiously as possible from Situation A to as close as possible to Situation B in the time allowed. This seems sensible enough and straightforward. The task is not uncomplicated, but many of the problems of *choice* seem not to plague the technique as they do benefit-cost and rates of return procedures.

One very desirable aspect of the manpower approach is its demand for an answer to its initial question: Where are we now? The required census encourages focusing on all sorts of appropriate questions: How many are in the labor force? What do they do? What are their ages? What are their skills? How are these skills defined? How are the skills measured? How were they acquired? How much substitutibility is there between various categories of manpower and between manpower and other resources? (e.g., To what extent can unskilled or semi-skilled workers replace skilled personnel? To what extent can manpower replace machines or *vice versa*?) Whatever the approach, the better and more complete the data regarding the initial situation, the more probably will useful results emerge. And the manpower approach seems more naturally to lead to a demand for carefully surveying the

current scene than do the other approaches. And the reasons for doing it seem reasonable and even "practical," the latter being of critical importance in the politically economic world in which policy decisions are made.

Further, the manpower approach seems readily adaptable to partial or sub-sector studies. "Industrial workers" can be enumerated, future needs for industrial workers can be estimated, and appropriate devices expanded or developed.

This is not without its problems, however. Information may be given to the educational planners that the agricultural sector is to expand 30 percent in the next decade, the industrial sector by 50 percent, the finance sector by 45 percent, and so forth. To be really meaningful, this information would be much more specific. For example, the industrial sector would be broken down at least into major industrial groups: metal, electrical, petroleum, etc. Someone, either the educationists or the general planners, must specify the technical relationships between these sectoral and sub-sectoral targets and manpower needs. That is, if agriculture is to increase by 3 percent per annum, this implies how many agricultural researchers? how many extension agents? how many rural credit specialists? how many specialists in agricultural marketing? how many tractor mechanics? In technical terms, each sector of the economy can be considered as a special sort of production function with the rate of growth being the output considered. Each of these production functions will have several inputs; for most of them, some indirect educational input will be included in the form of increments of trained or skilled human resources. This educational input, or better,

"the various educational sub-inputs," will be described in terms of numbers of people with specified skills or knowledge to be employed at certain dates. This schedule of "educated" or "trained" inputs into the nation's various production processes will be in essence the outputs required of the educational machinery of the nation. Making the situation even more complex, within some limits educational inputs in the production functions for each sub-sector are probably substitutes for other factors and with the educational list of outputs, one "product" may be substituted for another within some limits.

This is a real world problem although it may be dressed up in analytical terms; increasing output in any sector will require increased inputs of the human factor. In some cases, only more labor may be required; in others, improved quality may substitute for quantity. The general planning establishment may estimate the technical coefficients (i.e., how many of each kind of input is required per percentage point increase in each output) and tell the educational establishment how many of each specific type of human resource to anticipate producing in each of several time periods. Alternatively, it may inform the educational establishment of the output targets for goods and services and leave the Ministry of Education (or whatever) to do its own estimating of the kinds and quantities of educational outputs required. The task--whoever has the responsibility--is no easy one.

Once it has been specified that different quantities of several varieties of labor are required, then programs can be developed, costs estimated, resources budgeted. If the resources supplied are not equal to those "required," then priorities have to be established with decisions made either not to produce

all items or to do less than an adequate job producing all or some of them--e.g., it may be decided that it is better to have 10,000 seventy percent competent engineers than 5,000 entirely competent ones. At this point, the problems of "administrative efficiency" become critical since most of the questions of "allocative efficiency" have either already been solved or taken care of in some other way.

This brings us back to the central hypothesis of this section--the illusory nature of the differences between the manpower approach and the two approaches discussed earlier. The balance for most practical exercises seems cast entirely toward the manpower approach, so it is worthwhile to examine the relation between the two. In general, benefit-cost and rates of return are concerned with allocative efficiency: how many resources should be devoted to this, to that, and to the other--based on the comparative costs and returns from alternative uses of resources. These are critical social questions and chronologically the first to be encountered and to be dealt with. The manpower approach takes as "given" most of the answers to allocative efficiency questions. That is, when most of the manpower questions are raised, it has already been decided on some basis or other that the glass industry ought to expand, that the buggy industry ought to be contracted, that transportation by air should expand, that sugar should contract but that soybeans should be expanded. Given all this, it is relatively easy to proceed on a manpower basis to provide the training, fill the holes, follow the plan. Upon consideration, it becomes clear that prior decisions regarding sectors to be expanded, contracted, and so forth are made (consciously or not) on the basis of some benefit-cost calculation, e.g., "more resources

should go into power generation since that is where we will benefit most." Thus, the two are seen to be not substitutes for each other but rather to be successive step approaches or "different level" approaches. Perhaps the most important implication of this is that there is no way one can be "shed" of the allocation questions by deciding to "adopt" the manpwer approach as opposed to the cost-benefit or rates of return approach.

Unique Characteristics of Non-Formal Education

Nearly all of that that has been said above applies to education in general as well as to non-formal education. This section will turn specifically to examining non-formal education and the special problems it has and advantages it offers. For these purposes, non-formal education is regarded as a variegated set of educational experiences planned and consciously delivered by some individual or agency, heterogeneous with respect to participant age and entry requirements, sponsorship, delivery agent, instructional method, duration, intensity, official recognition, material offered. In general, it is specifically vocationally oriented with the major exception of literacy training.

It is perhaps an advantage to us as analysts that non-formal education requires that we begin by looking closely at measurement techniques. The standard technique of measuring efficiency in education is denied us: we cannot sensibly divide total costs by some unit of *input* to obtain an average cost per unit of *output*. Such is theprocess when costs are divided by the number of students (an input) to obtain costs per student, a technique which

uses an input (i.e. student-years) as a dummy for output. For standardized, formal primary and secondary school situations, the procedure has some legitimacy providing it is used knowingly and with care. What makes the procedure legitimate is the implicit assumption that passing a youngster through one year of school has some educational result, standard throughout the system and will recognized (whether it is or not) by everyone. Then it *may* be possible to compare efficiency as between schools on the basis of costs per student-year. We recognize that this is no longer applicable at the university level where a reasonable cost per student-year in economics is no more equal that of cost per student-year in medicine than is the level of the salaries of professors in the two academic sub-units.

Education, as I see it, is the process of transforming a person or set of persons from some defined initial state to some defined intermediary or final state. It is this transformation and efficiency in bringing it about that causes the measurement problem. At the outset, the fact of a student's mere presence is not a very good measure of the transformation one is seeking to measure.

This becomes particularly a problem in the case of non-formal education because most experiences are not standard ones. It is neither possible nor legitimate to start with the assumption that "participant hours" or "participant years" is any measure of what is accomplished. To do so would beg the question of measuring program output. Furthermore, the student or participant is far from the standard he tends to be in the usual formal schooling situation. He may be a common laborer; he may hold the highest university degree. He may have had little schooling prior to the non-formal experience;

and he may have had all sorts of other non-formal experiences. The program may last a month; it may last several years. It may be on-the-job in which case absence from production may be a cost to the employer; it may be off-the-job but while the worker is fully employed. In that case, what, if anything, is "forgone" and how is it to be "costed out?" Is the participant's "leisure forgone" not to be valued in some way? The objectives may be well defined as that of training non-skilled workers to be "lathe operators' helpers," or they may be defined specifically enough in terms of making persons "functionally literate" leaving the use of this transformation and its value not too clear. This is the critical point: There is no convenient shortcut in non-formal education as there may be for some purposes in formal education for the measurement of output. Non-formal education is forced to define very clearly what it is trying to do and then to measure its results if there are to be any answers to questions of efficiency and return. This is at once an advantage and a disadvantage.

The purposes of non-formal education are usually narrower than those of formal education, however poorly the latter might be defined. The narrower the definition of objectives and the more clearly they are laid out, the more nearly it may be possible to make some meaningful measurements of educational outputs. This may be the result of testing in the case of skills learned or the formal qualification for some particular job--providing the latter is not simply a device to restrict entry into the profession or occupation in question. It may then be possible to describe a series of alternative systems which start with persons with a set of characteristics, S, and with them perform some transformation so that they finally have a set of

characteristics, T. With skill and good luck, each of these alternative systems could be costed "over the relevant ranges" so as to permit comparison of the alternative systems as to "efficiency." The phrase "over the relevant ranges" is to emphasize the possibility of the effects of size in different delivery systems.

Further, the need to describe carefully the initial and terminating sets of characteristics is emphasized. Inputs of individuals will not be homogeneous but ought to fall within a fairly small range of variance with the meanings of the variance understood. An optimal training program for producing lathe operators, say, from seventeen-year-old youths picked up off the farm would possibly not be the same as one designed to produce lathe operators from unskilled but experienced factory workers within a single plant. Both groups might complete the programs with a set of characteristics T but they might have started with sets of characteristics S_1 and S_2 causing the programs to have rather different educational tasks. Or, it might be that two identical groups may be trained as lathe operators--one to do a limited number of operations by rote and the other to do the same operations but with an understanding of the process, knowledge of maintenance of the machinery, capacity to suggest improvements, etc. This stresses perhaps the obvious that perpetrators of these sorts of output measurements are not without a few sticky problems of their own and ought to handle the comparisons of efficiency as between programs with a fair amount of care and understanding.

There is no great difficulty in making comparisons between alternative means of producing a *homogeneous* product. With appropriate information and/or time to develop it, alternatives can be ranked in order of "cost effectiveness." Whether one wants to call this "economics" or "administration," much can clearly be done here by specialists in developing data, requiring clear statements of objectives, developing measurement criteria and tools, etc., so that the society can get more from the resources it dedicates to the purposes in question.

But this is of no help, to come back to our earlier theme, in answering the question of whether society should produce lathe operators or automotive mechanics. It helps little, either, to be told that it costs three times as much to produce one compared to the other. And it is not definitively helpful to be told that the more expensively produced specialist earns four times as much as his counterpart. If we want finally to make comparisons between programs to produce mechanics, lathe operators, watch makers, farm managers, and so forth, then there is no alternative but to put *values* on each. Present market values serve some useful purposes, but we produce for the transformed future; and those market values may also vary considerably in private returns as opposed to social returns. This reraises all the problems of valuing benefits and returns.[15]

Let me drag out one other piece of economic paraphernalia: economies of scale. This is useful in stressing still another point. The notion of economies of scale is that with some products--and in varying degrees among them--the unit cost will decline as output is expanded. Depending upon the

product, there are many explanations as to why this might occur. It is justifiably arguable, I think, that formal education and all its attendant apparati are efforts to capture economies of scale ("advantages of mass production" if you prefer)--teachers of multiple pupils instead of tutors, teacher training institutions, standardization of raw materials through age-specification, standard texts, schools, standard or minimal curricula, standard class periods, etc., etc.

Much of what has been attractive about non-formal education has been its innovativeness, individuality, imagination, its freedom from the constraints either of bureaucracy or the bonds of tradition. A major portion of the rationale of formal education is to capture the advantages of the economies of scale (i.e., "to get the costs down") which has led to much of the centralization and standardization which some find so stultifying. There is some considerable danger that the desire to replicate in the large a successful, innovative non-formal education adventure will result in turning it from "small," "free," "innovative" into "large," "cumbersome," and "regulated." This is not necessarily "bad," but it is important to recognize that one of the features we may like about the "non-formality" may largely disappear when massiveness is attempted. The Nicaraguan literacy campaign is evidence: its organization and standardization were even very much along military lines (i.e., columns, squads, brigades, standard tests, reports, questionnaires). The Freire method was adopted but modified in part by dropping the preferred village- or region-specific workbook for a standard national one.[16] SENAI "schools" in São Paulo are just that--schools, hardly distinguishable from traditional or "formal" institutions.

Economies of scale in education are related to population densities; that is, its potential subjects are physically dispersed in rural areas as compared to urban areas. This feature may make the delivery of a particular "lesson," "message," "experience" much more difficult and/or much more expensive than would be the case in an urban setting. This is a well-known but not systematically considered fact of life.

Finally, there is abroad the notion that non-formal education can be an inexpensive, pervasive substitute for formal education and that perhaps it will serve as some sort of panacea for the human resources problems of the developing world. "The Third World countries cannot afford universal, traditional education; therefore, there must be some sort of substitute. *Voilá*, non-formal education." This is perhaps overdrawn, but the view even in less extreme form warrants three brief comments:

1. One may argue that the formal educational system and its administration are inappropriate and, furthermore, incapable of reform. Then, it *may* follow that a substitute system should be developed. There is considerable probability, however, that the centralization and massification of the substitute system would subject it to the same political and bureaucratic processes as the formal system and would point it toward the same ossification.

2. Non-formal education is generally not viewed as a real "substitute" for the formal structure but as an appendage or supplement or a substitute at the margin. It is entirely possible that the non-formal alternatives are more effective in providing some services, but this is a far cry from arguing that because non-formal education is more effective in some activities it should

be more effective in all. And non-formal educational experiences may be better ways to produce lathe operators in a population where functional literacy skills are already present than more traditional means, but this does not argue either that all the tasks of education are better performed by non-formal education. The formal, traditional educational mechanism is designed--if for nothing else--to capture advantages of the economies of scale. This can be (and doubtless is) overdone, but the fact is that traditional patterns everywhere are partly the result of a search for *efficiency* especially when measured in terms of costs per pupil. This does not argue, incidentally, either that formal education is efficient or that non-formal education is inefficient. But it does argue that non-formal education as a supplement to the formal structure is quite a different activity than it would be were it assigned all the tasks of the formal system.

3. The prescription that non-formal education ought to be substituted for traditional education is a narrow one, and particularly a narrow economic one. Its principal defect is to overlook the social returns related to participatory democracy and the necessary role education must play in providing the bases of democracy. The spirit of the nation as a community, the sense of belonging, the notion of commonality of history and of destiny, and the competence necessary to participate in social decisions[17] are perhaps the most valuable products of schools (however badly they do their jobs). These are imponderables, impossible to value and measure, but this does not deny their existence nor suggest ignoring them. Truly alternative educational devices, if they are to be substitutes, ought to seek ways of inculcating these values as well as the more easily treated specific ones usually associated with non-formal educational projects.

The Rural Sector

It is certainly easiest to discuss non-formal educational matters in terms of job-oriented, vocational-type educational activities of the modern (urban?) sector. Our interests here, however, are specifically with the rural sector which encompasses the mass of people and especially the mass of the destitute.

In the abstract, economics has essentially the same message for this sector as for others, but the practice becomes more complex, depending very much on what one imagines in considering non-formal educational programs in rural areas.

In all probability the ties of "benefits" to some single, measurable variable will be much less clear and demonstrable. A worker with certain skills receives a differential wage in the industrial sector; but the peasant benefits (to say nothing of "social" benefits) in a much more obscure fashion for a number of reasons. First, most agricultural worker-employees are not highly specialized and acquiring a single new skill would be one new string among many on his bow, the return for which would be difficult to distinguish. There may be exceptions to this in a few cases of plantation labor, but the general notion is reasonable. The industrial worker, on the other hand, tends to be specialized, and his skills tend to be hierarchical and replaceable rather than complementary. Second, most peasants are not compensated in *money wages* and the structure of the earning system is little described and understood. Ultimately, earnings depend on what is produced for consumption and sale. These sales may be made in monopolistic markets, thus reducing the

usefulness of product price in measuring "social benefit." But tenancy provisions, monopsony in the agricultural labor market, payment in kind and/or in permitted use of *hacienda* lands further separate the actual compensation of the peasant from the product and its value. This suggests that increasing agricultural productivity is not necessarily enough; for the benefits may accrue to the urban society, the landed, or to middlemen depending upon the market structure and institutional arrangements. Even the rare case of the owner-operator, commercial-farmer peasant who sells in a relatively competitive market[18] would present much more difficult problems of "return" or "benefit" estimation than the case of the skill-compensated industrial counterpart. A whole range of skills, techniques, and knowledge is always brought to bear in an agricultural enterprise, and the effect of change in any one of them is difficult to isolate.[19] The owner-operator, *subsistence*-farmer peasant presents other problems--particularly those of record keeping and measurement.

One can easily envisage a multiple-thrust rural development program--one aimed at improved marketing, increased fertilizer use, purer drinking water, improved nutritional standards, and so on. "Costing" such a program would be complicated involving, first, separating sets of joint costs from several agencies (e.g., Ministry of Health, Ministry of Agriculture, Ministry of Education) and then aggregating the results. Benefits would be even more difficult to measure (e.g., decreased infant mortality, improved sewing skills among the women, fewer caries, *and* better crops) and, once measured, to assign values.

It is perhaps easier to think of this sort of comprehensive *agricultural* rural program in the large because it lacks the specificity at the local level of a course to train tractor drivers. What effect does this consideration at a national level or regional level have? First, it eliminates or reduces the problems of joint costs: the higher the level, the fewer the problems of jointness although if there are non-related programs some joint cost problems will remain. Second, there may be an illusion that consideration of benefits is easier. But, in the final analysis, benefits accrue (by design) to thousands of individuals on the land and in the villages; aggregating benefits in the nation's capital by estimation really begs the question of benefits rather than answering it.

Suppose, finally, that all these problems are solved and that solid estimates of costs and benefits can be made and that the ratio for a given rural program is smaller than for a modern-sector industrial training program. This is (would be) very valuable information, but it might *not* still be conclusive with respect to an investment decision. If there were a desire to redistribute income to the rural sectors, some additional "social" component might be added to the "private" benefit to increase the benefit-cost ratio to some desired level. The size of this component depends on political-social values, the objective quantification of which is not possible. One might be tempted to multiply all rural project benefits by 1.5 as an arbitrary expansion factor to give them additional weight in the decision-making process, but the purely arbitrary nature of the multiplicand is so great that any widespread use of benefit-cost analysis to reach decisions in the selection between specific modern-sector *versus* rural-sector programs is not likely to develop soon.

This analysis is discouraging with respect to the immediate use of benefit-cost results to favor or deny on an objective basis investments in particular projects. Even cost effectiveness calculations must be regarded as less than perfect. These difficulties stem from the nature of the envisaged program--joint costs, joint products, and results not quantifiable or not susceptible to valuation. The "economics" has not somehow become worse, but the problem is much more complex. It has been ever thus, and decisions have been and will continue to be made without the benefit of a number as an objective guide. Certainly the discouragement is not to be interpreted that projects should be suspended, discriminated against, or favored because of inability to evaluate them precisely. Nor is the difficulty of the task to be interpreted that efforts to evaluate should be given up. Imagination and a great deal of hard work can tell us much that we do not now know, particularly about the rural sector.

Conclusions

The principal conclusion concerning the role of economics with respect to evaluating non-traditional education is evident: Analytically or in the abstract, economic questions and their answers are at the heart of very tough questions related to the national allocation of resources *but* performance in providing empirical responses to these questions falls far short of that desired. This is particularly true for developing economies which cannot afford large segments of their labor force accounting for the activities of the remainder of the labor force. Further, empirical results become more

suspect the broader the question asked. Less certainty attaches to responses to questions concerning the allocation of resources between education, defense, and agriculture than to those concerning the allocation between engineering education, medical education, and agricultural education. Even better answers can be given for selection between alternative means of accomplishing a given educational task.

"Developing economies" is stressed in the conclusion above for two reasons: (1) The data required for benefit-cost and/or rates of return analyses are sophisticated and frequently only available in the richer countries--if there.[20] (2) More important, economic techniques of measurement rely heavily on the past and apply best for small increments at the margin. "Development" for the Third World countries is *change* in the future, and, indeed, radical change rather than marginal. With comparatively good data, with magnificent research facilities and budgets, we are far from having solid answers to many of these questions for the United States as the work of Schultz, Solo, Dennison, Bowles, et.al. attests.

The purposes of concern make a great deal of difference in the conclusions one reaches. If we are concerned about planning, then questions are asked in an ex ante sense: What will be the costs? What will be the outcomes of projects A,B,C, etc.? This is a sort of evaluation in advance and much more difficult than ex post analysis. Planning and allocation are the critical functions, but ex post analysis is the history from which we must learn if we are to avoid repetition of mistakes. More and more we see "evaluation requirements" being built into project designs.

The *answers* may be poor for want of data and weakness of concept, but the *questions* are the appropriate ones. Those responsible for allocating and administering scarce resources ought always to be engaged in seeking to answer two questions:

1. Why this activity rather than some other? What can society expect from it as opposed to another expenditure?

2. How can we get more "transformation" of a particular kind once resources have been committed to a certain activity?

It is regrettable that economics cannot yet crank out simple, unambiguous answers to the questions posed at the national and interministerial level. Its predictive and comparative tools are simply too weak. This calls for a great deal more research than has been done or even contemplated. Studies at the macro level may now be productive enough to aid decision-making by supplementing intuitive and political criteria, and they yield very valuable by-products in the form of new data and new relationships as they aid the search for better methodology. Most valuable and immediate returns, though, will come from competent, intensive research done on particular projects or programs. These case studies will break out new data; they will begin to formulate data needs for evaluation so that delivery agencies will be encouraged to develop needed data, better methodologies for evaluation may be evolved; and important descriptive program material may be disseminated. Little by little, this knowledge must be developed and integrated.

Along these lines, little is known about the scope and effectiveness of non-formal education in the Third World. We know even little about the identities of the providers of training. Attention needs to be given, perhaps first of all, to this census question. Careful attention, then, needs to be

given to the problems of good definition and measurement for small enough programs so that goals can be treated unambiguously and outputs can be subjected to measurement. Without measurement of outputs and inputs there can be no evaluation, and unless some systematic means can be found to put those into some common terms (e.g., money values), the critical comparisons between alternative means and between programs cannot be made. There is no good alternative to suggest in the face of the failure of economics to supply requisite answers. An anonymous observer notes pragmatically and philosophically: "A thorough description of the educational system of any country will reveal more inefficiency than its government will be willing to deal with in our lifetimes."

Resources have been and will continue to be allocated by societies in the absence of precise methodological indications of "best" solutions. Economics provides a rationality for the allocation of resources but is not yet able to handle with assurance the operational aspects of that theory for an investment so complex as education. It is not the best of all worlds, but it is certainly not amiss to raise constantly the questions associated with rationality--even granting that for the time being a great deal of decision-making will of necessity depend little on the formal answers of economic theory and of econometric models. Decision-making will perforce proceed and we hope with much good sense and solid intuition constantly policed by an observant and responsive political mechanism.

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NOTES

1. Specifically excluded so far as is possible from the scope of this essay is the perplexing, "external" problem of the relationship between "education," of whatever variety, and "development," however defined.

2. I have no better definition of non-formal education than anyone else. "Non-traditional" perhaps is better. "Out-of-school" is useful only if it is understood to be applicable for school-age youngsters and beyond. The difficulties of definition lie in part in the great variety of possible objectives, target groups, and methods. Further refining the matter of definition, I leave to someone else.

3. Perhaps this idea needs some elaboration. Implicit in my statement is the idea of the divisibility of inputs; explicit is the idea of balancing at the margin. Look first at the latter. Suppose two investments (A and B) produce returns (somehow measured and comparable) as follows for the pesos invested.

	1st $	2nd $	3rd $	4th $	5th $	6th $	7th $
Investment A	7	6	5	4	3	2	1
Investment B	15	13	11	9	7	5	3

If one has $9 to invest, the maximum return is obtained if $3 are invested in "A" and $6 in "B." This gives a total return of 15+13+11+9+7+5 (6 investment units of B) +7+6+5 (3 investment units of A) = 78. There is no way to rearrange investments to make this sum any larger. The arithmetic is not as important as the realization that the process involves an equal return from the last peso expended for each investment. The total returns from each may be very different--as indeed they are in our very simple case. "A" returns $18 and "B" $60.

We could "solve" the above for different levels of investment (e.g., $10, $8,) if the functions are continuous and if the outputs are divisible. These are usually non-heroic assumptions for the economist; but in our particular case of non-formal education in rural settings continuity and divisibility may not always obtain. One can't profitably dig part of a well, for example.

It is common for economists to utilize negatively sloping functions when dealing with the investment rule. And there is little doubt but that "decreasing marginal returns" are usually experienced in the large or macro situation. This may not always be the case in microcosms. If the functions are not negative in the relevant range, ordinarily investment would be limited to a single opportunity. The theory was developed to apply to monetary investments (in real processes, to be sure) for marketable

commodities or services where the returns were easily recognizable in monetary terms. Education produces returns neither clearly recognizable nor marketable which accounts for some lack of precision. A great problem in education, especially non-formal education, is the definition, measurement, and valuation of the outputs (i.e., "products" of the processes). This does not make the investment rule less important but it certainly makes it harder to apply. And it makes it more difficult to "sell" projects to potential sources of funds. There may be considerable "planning bias" against projects with less easily quantifiable expected results. This may lead to bad decisions and/or bogus quantifications.

This is good "capitalistic" theory, devoid, however, of any particularly normative content. Nonetheless, I cannot see how it does not become the central preoccupation of all planning processes--there are real costs, the returns from which a society, government, ministry wants to maximize. "Returns" may be defined differently but the principle must be much the same.

4. "Funds" is a short-hand expression for "real resources" since it is these which are used up rather than money.

5. There are technical differences which are discussed in the literature with each method having some advantages and disadvantages. Works related to the topic at hand include Manzoor Ahmed, The Economics of Non-formal Education: Resources, Costs, and Benefits. New York: Praeger Publishers, Inc., 1975. Manuel Zymelman. The Economic Evaluation of Vocational Training Programs, World Bank Staff Occasional Papers No. 21, Washington: The World Bank, 1976. One bibliography gives special attention to our topic: M.S. Mannan, The Economic Aspects of Non-Formal Education: A Selected Annotated Bibliography, Supplementary Paper No. 3, n.d. East Lansing, Michigan: Institute for Studies in Education. Two more general bibliographies merit attention. W. D. Wood and H. F. Campbell, Cost-Benefit Analysis and the Economics of Investment in Human Resources: An Annotated Bibliography. Kingston, Canada: Industrial Relations Centre, Queen's University, 1970. Mark Blaug, Economics of Education: A Selected Annotated Bibliography. New York: Pergamon Press, 1978. A recent and very general work is the following four volume work: I. Russell G. Davis. Issues and Problems in the Planning of Education in Developing Countries, II. _____. Models and Methods for Systematic Planning of Education. III. David Kline, Research Methods for Educational Planning, IV. Gary Lewis. Data Analyses for Educational Planning. Cambridge, Mass.: Harvard University, Center for Studies in Education and Development, 1980.

See also Non-Formal Education Information Center, NFE Core Bibliographies. East Lansing, Michigan: Institute for International Studies in Education, Michigan State University, 1981. A very interesting and recent how-to-do-it book is Victor Levine, et. al. A Manual for the Analysis of Costs and Outcomes in Non-formal Education. Princeton, N.J.: International Office, Educational Testing Service, 1979.

These few items are a part of the considerable body of literature related to the still broader topic, "project evaluation."

6. See Michael Lukomski, Alternatives for the Training of Skilled Industrial Labor in São Paulo, Brazil. East Lansing, Michigan: Supplementary Paper No. 1, Institute for International Studies in Education, n.d.

7. Charles L. Stansifer, The Nicaraguan National Literacy Crusade. Hanover, N.H.: American Universities Field Staff, 1981/No. 6, The quotation is from p. 2.

8. Ibid. pp. 1-2.

9. Ibid., p. 2.

10. When such records exist; they likely will not do so in the rural sector.

11. The "present value" of an income stream is sometimes computed to compare to "present costs" of the project to produce it. If the former exceeds the latter, the investment is "warranted" in the sense it is worth more than it costs, but this gives no clue as to its merit *vis à vis* other projects. The problems associated with this are those of estimating costs and particularly the income stream and those of selecting *some* rate of interest for discounting the income stream.

12. The "tagging" techniques proposed by Professor Harbison, of course, are only relevant when there are historical projects which one wants to replicate.

13. Suppose three groups of individuals who have all finished primary school are identified with non-formal experiences indicated by lower-case letters as follows:

Group 1	Group 2	Group 3
a	a	a
b	b	b
c	c	e
d	d	d
	e	c

If earnings are found to be different between groups, can the difference between Group 1 and Group 2 be attributed only to the application of experience "e"? Will the difference between Groups 2 and 3 be attributed solely to the order in which the experiences are applied? Will the differences between Groups 1 and 3 be attributed to the difference in order? the addition of experience "e"? or both? This simple hypothetical example illustrates two points: (1) when the applications are small and multiple, the problem of securely identifying a control group is immensely difficult; and (2) even the intuitive assignment of cause and effect becomes less than certain.

14. Russell G. Davis, op.cit. Vol. I, discusses a third alternative "Social demand." See particularly his Chapter III. See also his laconic summary (with Maritza Barrios), p. 81. "The answer seems to be that rate-of-return has been used somewhat less than manpower planning, which has been used less than social demand, which probably was not consciously used as a planning approach at all."

"Social demand" is defined earlier (p. 41) as "all forms of educational planning which are not based on, or referenced to, economic growth goals or economic cost criteria." There follows a short discussion of rates-of-return and manpower models and then (p. 42) "Social demand has no such basis in social theory. The term is vague. Theoretical backing is missing. Applications which might be called social demand planning are a mixed lot."

15. One of the frequently cited pitfalls of evaluation in formal education is that of distinguishing between expenditures for education as "investment" and those as "consumption." A course in French may provide a lifetime of pleasure to one student who uses it to enjoy French poetry. The same course taken by another student might enable him to become a productive export-import house manager. The former case represents expenditure by the society for "consumption," and the latter is "investment" in the sense that it adds directly to the nation's productive capacity. Much of traditional education is a mixture of both although precise determination of the ratio is not possible. But the issue is an important one in formal education since "investment" expenditures have positive growth and developmental implications while "consumption" expenditures are at best neutral. Non-formal education seems to be without large elements of this particular problem. As we envisage the latter, it is largely job-, skill-, task-oriented (although it need not be), and the major elements are "investment" with little expenditure for "consumption" in the sense employed here.

16. Stansifer, op.cit., especially p. 8.

17. Cf. the stated objectives and secondary objectives of the Nicaraguan literacy campaign, p. 9.

18. So that the assumption is tolerable of prices representing social benefits reasonably well.

19. One can imagine holding everything else constant and "applying" additional fertilizer--estimating fertilizer costs *c.i.f.* and measuring increased output at its sale price (benefits), but this is hardly what I understand by a "rural development" program.

20. See for example the complex research design and wealth of data required to evaluate a relatively simple program. Einar Hardin and Michael E. Borus, The Economic Benefits and Costs of Retraining. Lexington, Mass.: Heath Lexington Books, 1971.